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FUEL CELL POWER GENERATING SYSTEM

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Inventor: YAJIMA TORU; AOKI TSUTOMU
Applicant: TOSHIBA CORP
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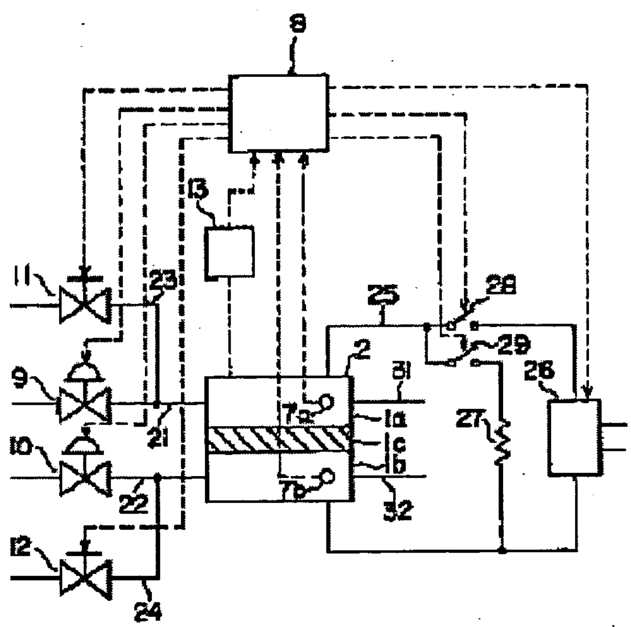
Abstract of **JP8138709**

PURPOSE: To prevent damage and deterioration of a fuel cell stack by measuring potential at one point of a fuel electrode of a unit cell of a fuel cell stack, and increasing fuel gas supply amount when the potential measured is higher than a set value.
CONSTITUTION: Potential measuring units 7a, 7b arranged near a fuel outlet of a unit cell in the lower part of a fuel cell stack 2, flow rate control valves 9, 10, shut-off valves 11, 12, an inverter 26, and first and second switches 28, 29 are connected to a controller 8. When potential measured with the potential measuring unit 7a is varied to high potential than an allowable range inputted in the controller 8, the flow rate control valve 9 is varied so as to increase the fuel gas flow rate, and the variation is continued until potential measured with the potential measuring unit 7a is lowered to an allowable range or lower inputted in the controller 8.



FUEL CELL POWER GENERATING SYSTEM

Legal status (INPADOC) of **JP8138709**

No legal data found.

JAPANESE [JP,08-138709,A]

[Translation done.]

* NOTICES *

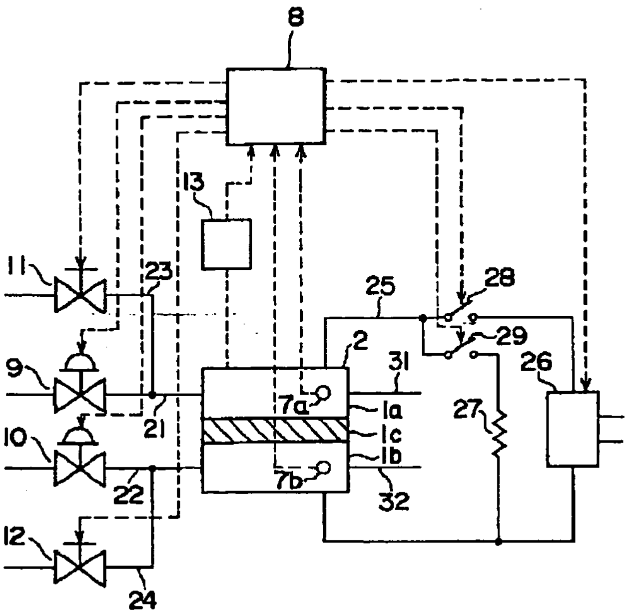
CLAIMS

[Claim(s)]
[Claim 1] The fuel cell layered product which comes to carry out the laminating of two or more unit cells formed on both sides of an electrolyte layer between a fuel electrode and an oxidizer pole, In the fuel cell power plant which consists of a fuel gas supply means to supply fuel gas to the fuel electrode of each unit cell of the fuel cell layered product concerned, and an oxidizer gas supply means to supply oxidizer gas to the oxidizer pole of each unit cell of said fuel cell layered product A potential measurement means to measure the potential of at least one point of the fuel electrode of at least one unit cell of said fuel cell layered product, The fuel cell power plant characterized by having the control means which controls said fuel gas supply means to make the amount of the fuel gas supplied to said fuel cell layered product increase when the potential measured by said potential measurement means becomes larger than the set point set up beforehand, and changing.
[Claim 2] Said potential measurement means is a fuel cell power plant according to claim 1 characterized by making it prepare in the neighborhood the fuel gas in said unit cell is discharged.
[Claim 3] The fuel cell layered product which comes to carry out the laminating of two or more unit cells formed on both sides of an electrolyte layer between a fuel electrode and an oxidizer pole, A fuel gas supply means to supply fuel gas to the fuel electrode of each unit cell of the fuel cell layered product concerned, An oxidizer gas supply means to supply oxidizer gas to the oxidizer pole of each unit cell of said fuel cell layered product, In the fuel cell power plant which consists of purge gas supply means to supply purge gas to the fuel electrode of each unit cell of said fuel cell layered product A potential measurement means to measure the potential of at least one point of the fuel electrode of at least one unit cell of said fuel cell layered product, The control means which controls said purge gas supply means to supply purge gas to the fuel electrode of each unit cell of said fuel cell layered product when the potential measured by said potential measurement means becomes larger than the upper limit set up beforehand, preparation ****** -- the fuel cell power plant characterized by things.
[Claim 4] It is the fuel cell power plant characterized by controlling said purge gas supply means to stop the purge gas supplied to the fuel electrode of each unit cell of said fuel cell layered product when the potential by which said control means was measured with said potential measurement means in said fuel cell power plant according to claim 3 becomes smaller than the lower limit set up beforehand.
[Claim 5] The fuel cell layered product which comes to carry out the laminating of two or more unit cells formed on both sides of an electrolyte layer between a fuel electrode and an oxidizer pole, A fuel gas supply means to supply fuel gas to the fuel electrode of each unit cell of the fuel cell layered product concerned, An oxidizer gas supply means to supply oxidizer gas to the oxidizer pole of each unit cell of said fuel cell layered product, In the fuel cell power plant which consists of purge gas supply means to supply purge gas to the oxidizing agent pole of each unit cell of said fuel cell layered product A potential measurement means to measure the potential of at least one point of the oxidizer pole of at least one unit cell of said fuel cell layered product, The control means which controls said purge gas supply means to supply purge gas to the oxidizing agent pole of each unit cell of said fuel cell layered product when the potential measured by said potential measurement means becomes larger than the upper limit set up beforehand, preparation ****** -- the fuel cell power plant characterized by things.
[Claim 6] It is the fuel cell power plant characterized by controlling said purge gas supply means to stop the

purge gas supplied to the oxidizing agent pole of each unit cell of said fuel cell layered product when the potential by which said control means was measured with said potential measurement means in said fuel cell power plant according to claim 5 becomes smaller than the lower limit set up beforehand.
[Claim 7] The fuel cell layered product which comes to carry out the laminating of two or more unit cells formed on both sides of an electrolyte layer between a fuel electrode and an oxidizer pole, A fuel gas supply means to supply fuel gas to the fuel electrode of each unit cell of the fuel cell layered product concerned, In the fuel cell power plant which consists of an oxidizer gas supply means to supply oxidizer gas to the oxidizer pole of each unit cell of said fuel cell layered product, and a switch which switches on or intercepts the current passed to said fuel cell layered product A potential measurement means to measure the potential of at least one point of the oxidizer pole of at least one unit cell of said fuel cell layered product, The fuel cell power plant characterized by having the control means which controls said switch to pass a current to said fuel cell layered product, and changing when the potential measured by said potential measurement means becomes larger than the upper limit set up beforehand.
[Claim 8] It is the fuel cell power plant characterized by controlling said switch to intercept the current passed to said fuel cell layered product when the potential by which said control means was measured with said potential measurement means in said fuel cell power plant according to claim 7 becomes smaller than the lower limit set up beforehand.
[Claim 9] Said potential measurement means is a fuel cell power plant given in any 1 term of claim 1 characterized by making it prepare in the unit cell located in the lower part of said fuel cell layered product thru/or claim 8.

[Translation done.]

Drawing selection Representative drawing



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the fuel cell power plant which is built over a fuel cell power plant, especially has the property temper device of a fuel cell layered product.
[0002]
[Description of the Prior Art] The fuel cell is known as equipment which transforms into direct electrical energy the chemical energy which a fuel has from the former. This fuel cell is equipment constituted so that electrical energy might generally be taken out from each above-mentioned inter-electrode one using the electrochemical reaction produced at this time by contacting oxidizer gas at the tooth back of an oxidizer pole as reactant gas between the electrode of the couple which used the porous material, i.e., a fuel electrode, and an oxidizer pole, while pinching the electrolyte layer holding an electrolyte and contacting fuel gas at the tooth back of a fuel electrode as reactant gas.
[0003] Here, as an electrolyte, although there are an acidic solution, a melting carbonate, an alkali solution, etc., by recently, the fuel cell of the phosphoric-acid mold which used the phosphoric acid has been considered to be the closest to utilization.
[0004] Drawing 3 is the decomposition perspective view showing the example of a configuration of the common phosphoric acid fuel cell which used the phosphoric acid as an electrolyte among this kind of fuel cells. As shown in drawing 3 , the fuel cell layered product (a fuel cell stack is called hereafter) 2 to which it comes to carry out the laminating of two or more unit cells 1 for a generation of electrical energy through the gas division plate 3 is formed in the body of a fuel cell.
[0005] The unit cell 1 is formed on both sides of fuel electrode (anode electrode is called hereafter) 1a of the couple which used the porous material, and electrolyte layer 1c in which oxidizer pole (cathode electrode is called hereafter) 1b contained the phosphoric acid.
[0006] Moreover, the catalyst by platinum etc. is applied to the field which counters with electrolyte layer 1c at this anode electrode 1a and cathode electrode 1b, respectively. Furthermore, the oxidizer negotiation slot where oxidizer gas, such as oxygen, circulates [the fuel negotiation slot where fuel gas, such as hydrogen, circulates] in the tooth back of cathode electrode 1b again is formed in the tooth back of anode electrode 1a, respectively.
[0007] On the other hand, whenever it carries out the laminating of two or more these unit cells 1 and gas division plates 3 by turns and they carry out a fixed number of laminatings, a cooling plate 4 is inserted. Moreover, the gas division plate 3 is constituted so that the electrical installation between the unit cells 1 may be secured, while classifying the gas supplied to each of anode electrode 1a and cathode electrode 1b. Furthermore, by pouring refrigerants, such as water, inside, a cooling plate 4 removes the heat produced with the electrochemical reaction which occurs by the unit cell 1, and it is constituted so that the temperature of the fuel cell stack 2 may be kept constant.
[0008] Moreover, in order to take out the current generated in the fuel cell stack 2 to such a fuel cell stack 2, the collecting electrode plate 6 is arranged at the edge of the upper and lower sides. Furthermore, in the side face of the fuel cell stack 2, the gas manifold 5 which supplies and discharges fuel gas and oxidizer gas, respectively is arranged at the fuel cell stack 2.
[0009] In addition, generally anode electrode 1a and cathode electrode 1b, the gas division plate 3, and the

cooling plate 4 are made by each considering carbon as an ingredient. The reason using this carbon is because it excels in phosphoric-acid-proof nature (corrosion resistance), thermal resistance, electrical conductivity, and thermal conductivity and can manufacture by low cost.
[0010] Now, in the fuel cell of the phosphoric-acid mold which has the above configurations, the following reactions occur in each unit cell 1 according to an operation of the catalyst by which the hydrogen supplied to anode electrode 1a was applied to anode electrode 1a.
[0011] H2 ->2H++2e - The hydrogen ion (H+) generated by the dissociative reaction of this hydrogen moves in the inside of the phosphoric acid stored in electrolyte layer 1c, and reaches cathode electrode 1b. On the other hand, an electron (e-) flows an external circuit from anode electrode 1a, works through a power load, and reaches cathode electrode 1b. And the following reactions occur according to an operation of the catalyst applied to cathode electrode 1b with the hydrogen ion (H+) which has moved from anode electrode 1a, the oxygen (O2) supplied to cathode electrode 1b, and the electron (e-) which has worked in the external circuit.
[0012] By 4H++O2+4e-->2H2 O, therefore the unit cell 1, while hydrogen oxidizes and becoming water, the chemical energy at this time turns into electrical energy given to an external power load. Thus, the overall reaction as a cell of the unit cell 1 is completed.
[0013] In addition, although the reaction in the above-mentioned unit cell 1 is exothermic reaction, this is cooled by the cooling plate 4 inserted in the interior of the fuel cell stack 2. Moreover, in a actual phosphoric acid fuel cell, as fuel gas, a steam (H2 O) is usually added and heated mainly to the natural gas which consists of methane (CH4), and the hydrogen generated by the following reactions is used.
[0014] CH4+H2 O->3H2+COCO+H2 O->H2+CO2 -- at this reaction, a carbon dioxide (CO2) is also simultaneously generated with hydrogen.
[0015] Therefore, the gas supplied to a fuel cell is the mixed gas of hydrogen and a carbon dioxide. Moreover, these amounts are like [which can be disregarded] although unreacted methane and an unreacted carbon monoxide (CO) are contained slightly. In addition, in the following explanation, this mixed gas is called fuel gas. Since a carbon dioxide is inactive electrochemically, even if a fuel cell is supplied, it does not check the above-mentioned reaction.
[0016] Moreover, generally as oxidizer gas, air is used. Although this air mainly consists of nitrogen and oxygen, since nitrogen is also inert gas, it is satisfactory even if a fuel cell is supplied.
[0017] By the way, in order for a fuel cell to generate electricity, each reactant gas fully needs to be supplied to anode electrode 1a and cathode electrode 1b. However, when supply of fuel gas runs short to the electrical energy (the amount of generations of electrical energy) demanded, fuel gas does not spread round the fuel cell stack 2 whole, but it will concentrate on the neighborhood (near a fuel gas inlet port) to which fuel gas is supplied, and the calorific value of this part will increase a reaction compared with a normal condition. On the other hand, in the neighborhood (near a fuel gas outlet) fuel gas is discharged, supply of fuel gas serves as imperfection, and a reaction will seldom occur, but calorific value will fall compared with a normal condition.
[0018] And if anode electrode 1a becomes an elevated temperature by the temperature rise such near a fuel gas inlet port, evaporation of the phosphoric-acid electrolyte currently stored in the cell and degradation of a catalyst etc. will advance quickly, and will become the cause of shortening the life of a cell.
[0019] Moreover, such a phenomenon happens similarly, when supply of oxidizer gas runs short by cathode electrode 1b. However, generally the amount of supply of fuel gas has few allowances over an initial complement. For this reason, the short supply of fuel gas has large possibility of happening, compared with the case where supply of oxidizer gas is insufficient.
[0020] And near a fuel gas outlet, when the short supply of fuel gas is remarkable, since a hydrogen ion is not supplied to cathode electrode 1b, the generation reaction of water does not occur. And the reaction which corrodes the carbon which is the ingredient of the following electrodes 1a and 1b, the gas division plate 3, and a cooling plate 4 instead of the generation reaction of water occurs.
[0021] C+2H2 O->CO2+4H++4e-C+H2 O->CO+2H++2e - If this reaction advances, a deficit will arise in the main components of a fuel cell, and operation of a fuel cell will become impossible.
[0022] Here, when the amount of supply of fuel gas runs short, the amount of electrical energy (the amount of generations of electrical energy) falls. That is, the electrical potential difference generated in the fuel cell

stack 2 will fall. Therefore, in the conventional fuel cell, the electrical potential difference of the fuel cell stack 2 is detected, and when it becomes below constant value with the electrical potential difference, the abnormality detection approach judged that abnormalities occurred in the fuel cell is taken, as it is indicated by "JP,4-61755,A" in order to prevent generating of the above abnormalities for example.
[0023] However, it cannot specify whether the electrical potential difference fell according to that the electrical potential difference fell with lack of fuel gas, or other causes, for example, lack of oxidizer gas etc., only by the abnormality detection approach by the electrical potential difference of such a fuel cell stack 2. Moreover, when it judges that it is unusual, although [invention indicated by "JP,4-61755,A"] operation of a fuel cell is suspended, when operation of a fuel cell is suspended, generation-of-electrical-energy dependability will fall remarkably.
[0024] It is a fuel utilization rate [in / on the other hand / in drawing 4 / the fuel cell stack 2 of the phosphoric acid fuel cell of drawing 3] (rate used for a generation of electrical energy among the hydrogen in the fuel gas supplied to the fuel cell stack 2.). there are no allowances in the amount of supply of fuel gas, so that this value is large -- expressing -- it is property drawing showing an example of relation with the electrical potential difference of the fuel cell stack 2.
[0025] As shown in this drawing 4 , it is the case where the amount of fuel gas decreases to near [which can be generated] the limitation when a fuel utilization rate becomes close to 100% as for an electrical potential difference falling greatly, and when an electrical potential difference falls and is judged to be unusual, the big adverse effect may already have attained to the fuel cell stack 2.
[0026] Furthermore, inside the fuel cell stack 2 and a gas manifold 5, the hydrogen in fuel gas is not necessarily distributed over homogeneity. As mentioned above, since the direction of hydrogen has the small consistency, it is tended for fuel gas to be the mixed gas of hydrogen and a carbon dioxide, and to concentrate hydrogen above the fuel cell stack 2. Therefore, even if it is not falling so that the electrical potential difference of the fuel cell stack 2 whole is judged to be unusual, the short supply of hydrogen may have arisen by the unit cell 1 located in the lower part of the fuel cell stack 2.
[0027] Then, as an approach of detecting the abnormalities of the unit cell of the lower part of such a fuel cell stack 2, the concentration of the carbon dioxide in the gas discharged from the lower part of the fuel cell stack 2 or a carbon monoxide is measured, and there is the approach of detecting that carbonaceous corrosion reaction has occurred as proposed by "JP,3-84951,A."
[0028]

TECHNICAL FIELD

[Industrial Application] This invention relates to the fuel cell power plant which is built over a fuel cell power plant, especially has the property temper device of a fuel cell layered product.

[Translation done.]

* NOTICES *

PRIOR ART

[Description of the Prior Art] The fuel cell is known as equipment which transforms into direct electrical energy the chemical energy which a fuel has from the former. This fuel cell is equipment constituted so that electrical energy might generally be taken out from each above-mentioned inter-electrode one using the electrochemical reaction produced at this time by contacting oxidizer gas at the tooth back of an oxidizer pole as reactant gas between the electrode of the couple which used the porous material, i.e., a fuel electrode, and an oxidizer pole, while pinching the electrolyte layer holding an electrolyte and contacting fuel gas at the tooth back of a fuel electrode as reactant gas.
[0003] Here, as an electrolyte, although there are an acidic solution, a melting carbonate, an alkali solution, etc., by recently, the fuel cell of the phosphoric-acid mold which used the phosphoric acid has been considered to be the closest to utilization.
[0004] Drawing 3 is the decomposition perspective view showing the example of a configuration of the common phosphoric acid fuel cell which used the phosphoric acid as an electrolyte among this kind of fuel cells. As shown in drawing 3 , the fuel cell layered product (a fuel cell stack is called hereafter) 2 to which it comes to carry out the laminating of two or more unit cells 1 for a generation of electrical energy through the gas division plate 3 is formed in the body of a fuel cell.
[0005] The unit cell 1 is formed on both sides of fuel electrode (anode electrode is called hereafter) 1a of the couple which used the porous material, and electrolyte layer 1c in which oxidizer pole (cathode electrode is called hereafter) 1b contained the phosphoric acid.
[0006] Moreover, the catalyst by platinum etc. is applied to the field which counters with electrolyte layer 1c at this anode electrode 1a and cathode electrode 1b, respectively. Furthermore, the oxidizer negotiation slot where oxidizer gas, such as oxygen, circulates [the fuel negotiation slot where fuel gas, such as hydrogen, circulates] in the tooth back of cathode electrode 1b again is formed in the tooth back of anode electrode 1a, respectively.
[0007] On the other hand, whenever it carries out the laminating of two or more these unit cells 1 and gas division plates 3 by turns and they carry out a fixed number of laminatings, a cooling plate 4 is inserted. Moreover, the gas division plate 3 is constituted so that the electrical installation between the unit cells 1 may be secured, while classifying the gas supplied to each of anode electrode 1a and cathode electrode 1b. Furthermore, by pouring refrigerants, such as water, inside, a cooling plate 4 removes the heat produced with the electrochemical reaction which occurs by the unit cell 1, and it is constituted so that the temperature of the fuel cell stack 2 may be kept constant.
[0008] Moreover, in order to take out the current generated in the fuel cell stack 2 to such a fuel cell stack 2, the collecting electrode plate 6 is arranged at the edge of the upper and lower sides. Furthermore, in the side face of the fuel cell stack 2, the gas manifold 5 which supplies and discharges fuel gas and oxidizer gas, respectively is arranged at the fuel cell stack 2.
[0009] In addition, generally anode electrode 1a and cathode electrode 1b, the gas division plate 3, and the cooling plate 4 are made by each considering carbon as an ingredient. The reason using this carbon is because it excels in phosphoric-acid-proof nature (corrosion resistance), thermal resistance, electrical conductivity, and thermal conductivity and can manufacture by low cost.
[0010] Now, in the fuel cell of the phosphoric-acid mold which has the above configurations, the following reactions occur in each unit cell 1 according to an operation of the catalyst by which the hydrogen supplied

to anode electrode 1a was applied to anode electrode 1a.
[0011] H2 ->2H++2e - The hydrogen ion (H+) generated by the dissociative reaction of this hydrogen moves in the inside of the phosphoric acid stored in electrolyte layer 1c, and reaches cathode electrode 1b. On the other hand, an electron (e-) flows an external circuit from anode electrode 1a, works through a power load, and reaches cathode electrode 1b. And the following reactions occur according to an operation of the catalyst applied to cathode electrode 1b with the hydrogen ion (H+) which has moved from anode electrode 1a, the oxygen (O2) supplied to cathode electrode 1b, and the electron (e-) which has worked in the external circuit.
[0012] By 4H++O2+4e-->2H2 O, therefore the unit cell 1, while hydrogen oxidizes and becoming water, the chemical energy at this time turns into electrical energy given to an external power load. Thus, the overall reaction as a cell of the unit cell 1 is completed.
[0013] In addition, although the reaction in the above-mentioned unit cell 1 is exothermic reaction, this is cooled by the cooling plate 4 inserted in the interior of the fuel cell stack 2. Moreover, in a actual phosphoric acid fuel cell, as fuel gas, a steam (H2 O) is usually added and heated mainly to the natural gas which consists of methane (CH4), and the hydrogen generated by the following reactions is used.
[0014] CH4+H2 O->3H2+COCO+H2 O->H2+CO2 -- at this reaction, a carbon dioxide (CO2) is also simultaneously generated with hydrogen.
[0015] Therefore, the gas supplied to a fuel cell is the mixed gas of hydrogen and a carbon dioxide. Moreover, these amounts are like [which can be disregarded] although unreacted methane and an unreacted carbon monoxide (CO) are contained slightly. In addition, in the following explanation, this mixed gas is called fuel gas.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] As mentioned above, in the conventional fuel cell power plant, when the generation efficiency of a fuel cell stack was reduced in order to prevent breakage and degradation of a fuel cell stack when the amount of supply of the fuel gas supplied to a fuel cell stack runs short, or the potential of an electrode rose at the time of starting of equipment, a halt, or storage, in order to prevent breakage and degradation of a fuel cell stack, there was a problem that where of purge gas was wasted vainly beyond the need.
[0055] The 1st object of this invention is to offer the fuel cell power plant which breakage and degradation of a fuel cell stack are prevented certainly, and can prevent property lowering of a fuel cell stack, without detecting the abnormality promptly and certainly and reducing the generation efficiency of a fuel cell stack at the time of the abnormalities from which the amount of supply of the fuel gas supplied to a fuel cell stack becomes insufficient.
[0056] Moreover, the 2nd object of this invention is to offer the fuel cell power plant which breakage and degradation of a fuel cell stack are prevented certainly, and can prevent property lowering of a fuel cell stack, without detecting the condition promptly and certainly and wasting purge gas vainly beyond the need, when the potential of an electrode may rise and degradation of the catalyst of an electrode may arise at the time of starting of equipment, a halt, or storage.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] The fuel cell layered product which comes to carry out the laminating of two or more unit cells formed on both sides of an electrolyte layer between a fuel electrode and an oxidizer pole in this invention as explained above, A fuel gas supply means to supply fuel gas to the fuel electrode of each unit cell of the fuel cell layered product concerned, An oxidizer gas supply means to supply oxidizer gas to the oxidizer pole of each unit cell of a fuel cell layered product, In the fuel cell power plant which consists of a purge gas supply means to supply purge gas to the fuel electrode of each unit cell of a fuel cell layered product, and a switch which switches on or intercepts the current passed to a fuel cell layered product if needed A potential measurement means to measure the potential of at least one point of the fuel electrode of at least one unit cell of a fuel cell layered product, When the potential measured by the potential measurement means becomes larger than the set point set up beforehand [whether it has the control means which controls a fuel gas supply means to make the amount of the fuel gas supplied to a fuel cell layered product increase, and] Or a potential measurement means to measure the potential of at least one point of the fuel electrode of at least one unit cell of a fuel cell layered product, When the potential measured by the potential measurement means becomes larger than the upper limit set up beforehand [whether it has the control means which controls a purge gas supply means to supply purge gas to the fuel electrode of each unit cell of a fuel cell layered product, and] Or a potential measurement means to measure the potential of at least one point of the oxidizer pole of at least one unit cell of a fuel cell layered product, When the potential measured by the potential measurement means becomes larger than the upper limit set up beforehand [whether it has the control means which controls a purge gas supply means to supply purge gas to the oxidizing agent pole of each unit cell of a fuel cell layered product, and] Or a potential measurement means to measure the potential of at least one point of the oxidizer pole of at least one unit cell of a fuel cell layered product, When the potential measured by the potential measurement means became larger than the upper limit set up beforehand, it had the control means which controls a switch to pass a current to a fuel cell layered product. Therefore, the fuel cell power plant which breakage and degradation of a fuel cell stack are prevented certainly, and can prevent property lowering of a fuel cell stack can be offered, without wasting purge gas vainly beyond the need, when breakage and degradation of a fuel cell stack may be prevented certainly, and the potential of an electrode may rise at the time of starting of equipment, a halt, or storage and degradation of the catalyst of an electrode may arise, without reducing the generation efficiency of a fuel cell stack.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned object, by invention concerning claim 1, first The fuel cell layered product which comes to carry out the laminating of two or more unit cells formed on both sides of an electrolyte layer between a fuel electrode and an oxidizer pole, In the fuel cell power plant which consists of a fuel gas supply means to supply fuel gas to the fuel electrode of each unit cell of the fuel cell layered product concerned, and an oxidizer gas supply means to supply oxidizer gas to the oxidizer pole of each unit cell of a fuel cell layered product A potential measurement means to measure the potential of at least one point of the fuel electrode of at least one unit cell of a fuel cell layered product, When the potential measured by the potential measurement means becomes larger than the set point set up beforehand, it has the control means which controls a fuel gas supply means to make the amount of the fuel gas supplied to a fuel cell layered product increase, and changes.
[0058] Here, as for especially the above-mentioned potential measurement means, it is desirable to prepare in the neighborhood the fuel gas in a unit cell is discharged. Moreover, the fuel cell layered product which comes to carry out the laminating of two or more unit cells formed on both sides of an electrolyte layer between a fuel electrode and an oxidizer pole in invention concerning claim 3, A fuel gas supply means to supply fuel gas to the fuel electrode of each unit cell of the fuel cell layered product concerned, In the fuel cell power plant which consists of an oxidizer gas supply means to supply oxidizer gas to the oxidizer pole of each unit cell of a fuel cell layered product, and a purge gas supply means to supply purge gas to the fuel electrode of each unit cell of a fuel cell layered product A potential measurement means to measure the potential of at least one point of the fuel electrode of at least one unit cell of a fuel cell layered product, When the potential measured by the potential measurement means becomes larger than the upper limit set up beforehand, it has the control means which controls a purge gas supply means to supply purge gas to the fuel electrode of each unit cell of a fuel cell layered product, and changes.
[0059] Here, when the potential measured by the potential measurement means becomes smaller than the lower limit set up beforehand, as for especially the above-mentioned control means, it is desirable to control a purge gas supply means to stop the purge gas supplied to the fuel electrode of each unit cell of a fuel cell layered product.
[0060] Furthermore, the fuel cell layered product which comes to carry out the laminating of two or more unit cells formed on both sides of an electrolyte layer between a fuel electrode and an oxidizer pole in invention concerning claim 5, A fuel gas supply means to supply fuel gas to the fuel electrode of each unit cell of the fuel cell layered product concerned, In the fuel cell power plant which consists of an oxidizer gas supply means to supply oxidizer gas to the oxidizer pole of each unit cell of a fuel cell layered product, and a purge gas supply means to supply purge gas to the oxidizer pole of each unit cell of a fuel cell layered product A potential measurement means to measure the potential of at least one point of the oxidizer pole of at least one unit cell of a fuel cell layered product, When the potential measured by the potential measurement means becomes larger than the upper limit set up beforehand, it has the control means which controls a purge gas supply means to supply purge gas to the oxidizing agent pole of each unit cell of a fuel cell layered product, and changes.
[0061] Here, when the potential measured by the potential measurement means becomes smaller than the lower limit set up beforehand, as for especially the above-mentioned control means, it is desirable to control a purge gas supply means to stop the purge gas supplied to the oxidizing agent pole of each unit cell of a

fuel cell layered product.
[0062] The fuel cell layered product which comes to carry out the laminating of two or more unit cells formed on both sides of an electrolyte layer between a fuel electrode and an oxidizer pole in invention concerning claim 7 further again, A fuel gas supply means to supply fuel gas to the fuel electrode of each unit cell of the fuel cell layered product concerned, In the fuel cell power plant which consists of an oxidizer gas supply means to supply oxidizer gas to the oxidizer pole of each unit cell of a fuel cell layered product, and a switch which switches on or intercepts the current passed to a fuel cell layered product A potential measurement means to measure the potential of at least one point of the oxidizer pole of at least one unit cell of a fuel cell layered product, When the potential measured by the potential measurement means becomes larger than the upper limit set up beforehand, it has the control means which controls a switch to pass a current to a fuel cell layered product, and changes.
[0063] Here, when the potential measured by the potential measurement means becomes smaller than the lower limit set up beforehand, as for especially the above-mentioned control means, it is desirable to control a switch to intercept the current passed to a fuel cell layered product. furthermore, the above -- as for especially a potential measurement means, in the case of which, it is desirable to prepare on the unit cell located in the lower part of a fuel cell layered product.

[Translation done.]

OPERATION

[Function] Therefore, it can judge first whether fuel gas runs short by comparing the potential of the fuel electrode measured with the potential measurement means in the fuel cell power plant of invention concerning claim 1 with the set point beforehand set up by the control means. And in a control means, without reducing the generation efficiency of a fuel cell layered product by controlling the flow rate of fuel gas and making a flow rate increase, when it judges that fuel gas is insufficient, breakage and degradation of a fuel cell layered product are prevented, it can continue and the engine performance of a fuel cell layered product can be maintained at a long period of time.
[0065] establishing a potential measurement means near [in a unit cell] the fuel gas outlet the hydrogen concentration in fuel gas becomes low especially in this case -- the short supply of fuel gas -- more -- an early stage -- and it is certainly detectable. Moreover, a potential measurement means can detect the short supply of fuel gas at an early stage more by preparing in the unit cell located in the lower part of the fuel cell layered product to which fuel gas stops being able to flow easily.
[0066] Moreover, in the fuel cell power plant of invention concerning claim 3 or claim 5, the potential of a fuel electrode or an oxidizer pole can judge whether it is going up to extent which degrades a catalyst by the residual of the oxidizer gas supplied to the oxidizer pole for a generation of electrical energy, trespass of external air, etc. by comparing the potential of the fuel electrode measured with the potential measurement means, or an oxidizer pole with the upper limit beforehand set up by the control means. And in a control means, when it judges that the potential of a fuel electrode is rising, it becomes possible by supplying purge gas to a fuel electrode to lower the potential of a fuel electrode. Or when it judges that the potential of an oxidizing agent pole is rising, it becomes possible by supplying purge gas to an oxidizing agent pole to lower the potential of an oxidizing agent pole.
[0067] Thereby, the degradation of the fuel cell layered product accompanying a generation-of-electrical-energy halt of equipment can be prevented, and the engine performance of a fuel cell can be maintained. Lifting of the potential accompanying trespass of air is more detectable at an early stage by forming a potential measurement means in the unit cell located in the lower part of the fuel cell layered product to which the air which invaded tends to pile up, purge gas cannot flow easily, therefore lowering of potential cannot take place easily especially in this case.
[0068] Moreover, when the potential of a fuel electrode or an oxidizer pole judges that it fully fell rather than the potential which degrades a catalyst by comparing the potential of the fuel electrode measured with the potential measurement means, or an oxidizer pole with the upper limit beforehand set up by the control means, by stopping the purge gas currently supplied to the fuel electrode or the oxidizer pole, useless waste of purge gas can be prevented and an advantageous fuel cell power plant can be obtained economically.
[0069] Furthermore, in the fuel cell power plant of invention concerning claim 7, when it descends to extent from which the potential of a sink and an oxidizer pole does not produce degradation of a catalyst for a current in a fuel cell layered product when it judges that the potential of an oxidizer pole is rising, the engine performance of a fuel cell layered product can be maintained by intercepting the current which flows to a fuel cell layered product.
[0070] Lifting of potential is more detectable at an early stage by an oxygen density's tending to become high, therefore forming a potential measurement means in the unit cell located in the lower part of the fuel cell layered product to which potential tends to rise especially in this case.

[Translation done.]

* NOTICES *

EXAMPLE

[Example] Hereafter, one example of this invention is explained to a detail with reference to a drawing. Drawing 1 is the block diagram showing the whole fuel cell power plant example of a configuration by this invention, and the same sign is given to a corresponding element, the explanation is omitted, and it describes only the same as that of drawing 3 , or a part different here.
[0072] In addition, although the laminating of two or more unit cells 1, gas division plates 3, and cooling plates 4 is carried out and the fuel cell stack 2 is formed as shown in drawing 3 , it simplifies here, and it shows only one unit cell 1, and represents the fuel cell stack 2 whole. Moreover, although it is drawn in drawing 1 so that fuel gas and oxidizer gas may flow in the same direction within the fuel cell stack 2, fuel gas and oxidizer gas flow actually in the direction which intersects perpendicularly mutually as shown in drawing 3 . Furthermore, about the gas manifold 5 and the collecting electrode plate 6, it is omitting by drawing 1 .
[0073] That is, as the fuel cell power plant of this example is shown in drawing 1 , the supply pipe 21 and exhaust pipe 31 of fuel gas are connected to fuel electrode 1a, and the supply pipe 22 and exhaust pipe 32 of oxidizer gas are connected to oxidizer pole 1b at the fuel cell stack 2, respectively.
[0074] Moreover, the flow control valves 9 and 10 which adjust the flow rate of each reactant gas are formed in each supply pipes 21 and 22. Furthermore, the purge gas supply pipes 23 and 24 which formed isolation valves 11 and 12 are connected to each supply pipes 21 and 22.
[0075] Here, as purge gas, it is common to use nitrogen, and the nitrogen gas cylinder or the liquid nitrogen tank is connected to the purge gas supply pipes 23 and 24 as a supply source of purge gas.
[0076] On the other hand, through the current line 25, the direct current taken out from the fuel cell stack 2 is changed into alternating current by the inverter 26 through the 1st switch 28, and is supplied to the power load of the exterior which is not illustrated.
[0077] Moreover, the fixed resistor 27 for passing a current very small as a dummy load is connected through the 2nd switch 29 at the time of halt actuation of the fuel cell stack 2 etc. And when the 1st switch 28 is closed, the fuel cell stack 2 is connected to an inverter 26, when the 2nd switch 29 is closed, the fuel cell stack 2 is connected to a fixed resistor 27, and when both two switches 28 and 29 are open, the fuel cell stack 2 will be in the condition of connecting with neither.
[0078] On the other hand, in the fuel cell power plant of this example, the potential measurement means 7a and 7b are established near the fuel outlet of the unit cell 1 located in the lower part of the fuel cell stack 2. Moreover, these potential measurement means 7a and 7b, flow control valves 9 and 10, isolation valves 11 and 12, an inverter 26, the 1st switch 28, and the 2nd switch 29 are connected to the control means 8, respectively.
[0079] When normal operation is performed (operational status is called hereafter), the potential (reference potential) which should be measured by potential measurement means 7a, and its tolerance are beforehand set up by this control means 8, and are inputted into it.
[0080] That is, since changing as shown in drawing 2 is beforehand checked by location survey or count when the flow rate of fuel gas changes, a reference potential and tolerance are determined based on this drawing 2 , and the potential measured by potential measurement means 7a is inputted into a control means 8.
[0081]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram showing one example of the fuel cell power plant by this invention.
[Drawing 2] Property drawing showing an example of relation with the potential measured with the flow rate of the fuel gas supplied to the fuel cell stack in the fuel cell power plant of this example, and the potential measurement means formed in the anode electrode.
[Drawing 3] The decomposition perspective view showing the example of a configuration of a common phosphoric acid fuel cell.
[Drawing 4] Property drawing showing an example of the relation between the fuel utilization rate in the phosphoric acid fuel cell of drawing 3 , and the electrical potential difference of a fuel cell stack.
[Description of Notations]
1 -- Unit cell,
2 -- Fuel cell stack,
3 -- Gas division plate,
4 -- Cooling plate,
5 -- Gas manifold,
6 -- Collecting electrode plate,
7a, 7b -- Potential measurement means,
8 -- Control means,
9 -- Fuel gas flow control valve,
10 -- Oxidizer quantity-of-gas-flow control valve,
11 -- Anode electrode purge gas isolation valve,
12 -- Cathode electrode purge gas isolation valve,
13 -- Abnormality detection means,
21 -- Fuel gas supply pipe,
22 -- Oxidizer gas supply line,
23 24 -- Purge gas supply pipe,
25 -- Current line,
26 -- Inverter,
27 -- Fixed resistor,
28 -- The 1st switch,
29 -- The 2nd switch,
31 -- Fuel gas exhaust pipe,
32 -- Oxidizer gas exhaust pipe.

[Translation done.]

* NOTICES *

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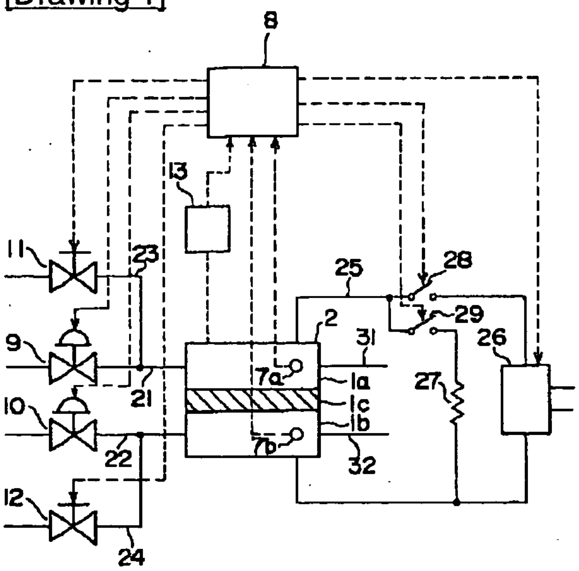
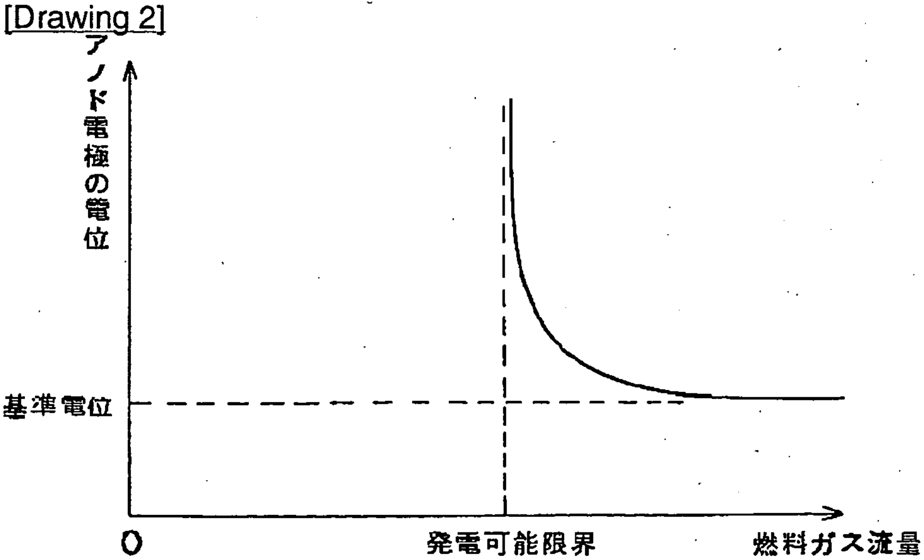
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

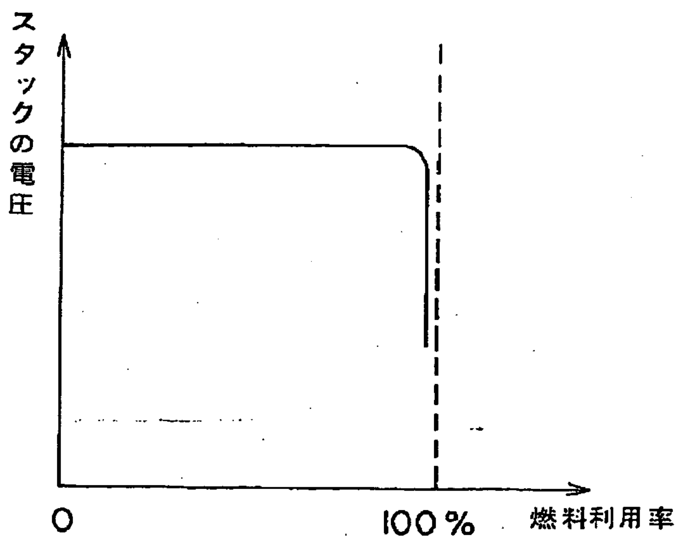
[Drawing 1]



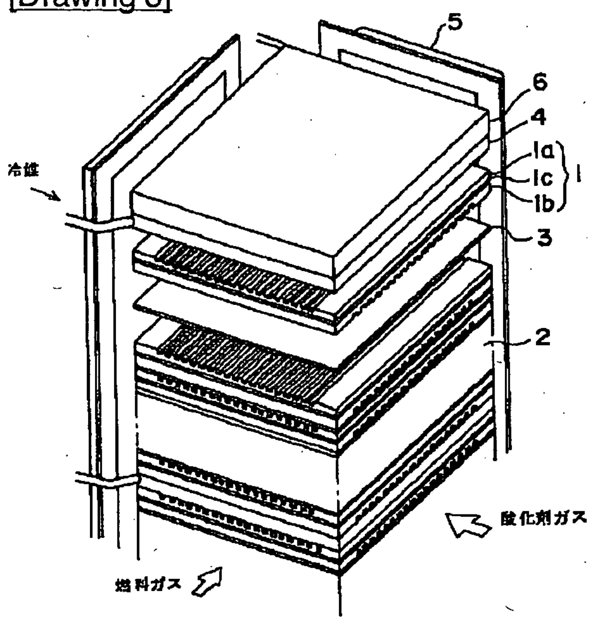
[Drawing 2]



[Drawing 4]



[Drawing 3]



[Translation done.]